FISCHER-PORTER UPGRADE (FPU)
Removal Instructions

for

Fischer-Porter Rebuild- Version E (FPR-E)
Offices

Draft: Jan 22, 2013

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service - Cooperative Weather Observer Program
Observing Services Division - W/OS7

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APPENDICES

1. Preparation for FPR-E Retrofit.

The FPR-E equipment will replace all of the FPU equipment without any shared or saved parts. The FPR-E system is physically smaller than the FPU system, and will be contained within the F&P housing. The solar mount for the FPR-E is illustrated in Fig 1.1, however this location so low to the ground is not ideal for locations prone to deep snow or snowdrifts. If the observer consents, you may mount the FPR-E solar panel where the FPU solar panel was mounted (Fig 1.2).

Fig 1.1 – Solar Mount for FPR-E as provided in kit.

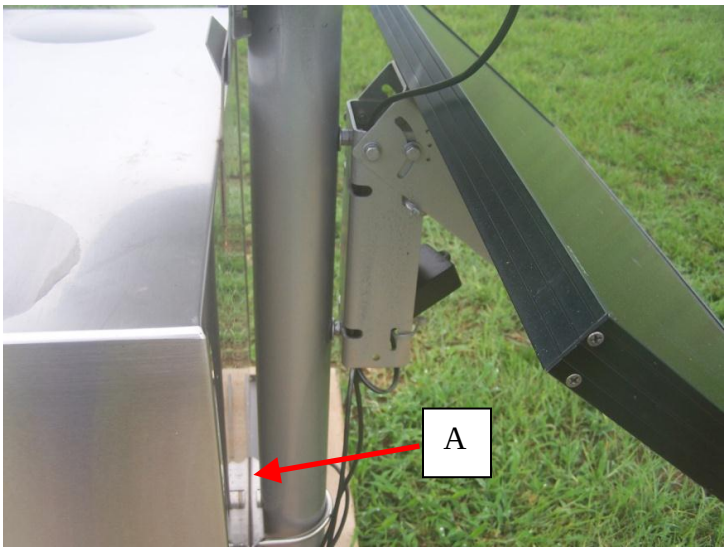

Fig 1.2 – Standard Mounting for FPU Solar Panel

If the provided FPR-E solar panel mounting scheme is too low or otherwise not practical, put the FPR-E panel where the FPU panel was, using the FPU solar panel mount.

However, the FPU mount will need to be lengthened to fit the FPR-E solar panel.

Use a stiff piece of metal with two predrilled holes 3-7/8 inches apart, or use the lower U-bolt clamp bracket from the FPU enclosure, as shown here.

Additional ¼ x 20 fasteners will be needed.

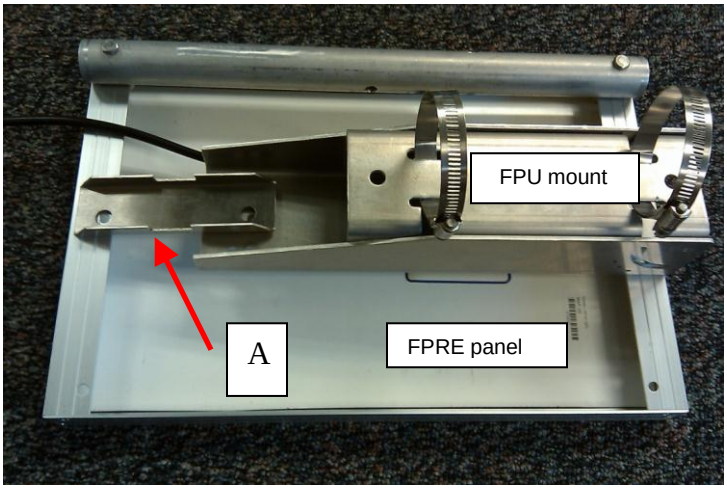

Fig 1.3 – Modify the FPU Bracket to fit FPR-E Solar Panel

The FPR-E solar panel is too large to safely mount on the old F&P pipe stand and is therefore not recommended.

NOTE: Ensure that you have a spare legacy F&P upper main-spring ***Hook*** and ***Adjustment Knob*** in your possession before driving out to COOP site to install the FPR-E.

Fig 1.4 –Legacy F&P part required in FPR-E Rebuild

1.1 Steps to FPU to FPR-E Modification:

1.1.1 Receive and Inspect FPR-E Kit in WFO:

Check for all Parts. Do not assemble FPR-E.

Time Required: 0.25-Hours.

1.1.2 Charge the 12V Battery:

Ensure battery charger indicates 'full.'

Time Required: As required to indicate 'Full Charge.'

1.1.3 Transport to Observer's Site:

Keep FPR-E Kit in original boxes. Save boxes to contain FPU used parts.

Time Required: TBD.

1.1.4 Download Precipitation Data from FPU:

Use the red plastic Datakey to download most recent 55-days of precipitation.

Use Laptop to download entire contents of Zeno logger.

Time Required: 0.25-Hours.

1.1.5 Drain and Wipe the Collection Bucket:

Time Required: 0.50-Hours.

1.1.6 Disassemble GMA Enclosure and Remove Pole (If Necessary):

For reference, detailed assembly instructions are found in, *FPU Assembly Procedural*.
http://www.nws.noaa.gov/ops2/Surface/documents/FPU_AsmblyPrcdrl08212006.pdf

Unplug Solar Cable, and Unplug Battery Cable, and Unplug Load-Cell Cable.
Remove the bonding wire between weighing gage chassis and Enclosure.

Remove 54-lb battery with help of an assistant.

Remove Solar Panel.

Remove Enclosure from Pole.

Remove Conduit from Ground (If necessary). If the FPU solar panel used extended wiring (i.e., buried conduit pipe) to get the solar panel out to clear sun exposure, and the observer consents to keep FPR-E solar panel at the same location as the FPU was (even if this was the GMA Pole), then use the existing conduit and wiring (if possible) to install the FPR-E solar panel. If you have to extend the existing wiring, use watertight connections, above ground connections, and enclose the connections in a small weatherized box.

Remove GMA Pole from ground (if necessary). Does not apply if the FPR-E solar panel will be attached to the GMA pole where the FPU solar panel was. If the pole is to be removed, then restore ground to firm, level surface. If pole is removed, then restore ground to firm, level surface.

Time Required: 3.00-Hours.

1.1.7 Remove the Load Cell:

Time Required: 0.10-Hours.

1.1.8 Install the FPR-E Load Cell, Logger, Solar Panel:
Follow detailed instructions in Sec 3, 4, and 5, of the *FPR-E Assembly Procedures*.
http://www.nws.noaa.gov/ops2/Surface/documents/FPRE_AsmblyPrcdr_17Feb2012.pdf
Time Required: 0.50-Hours.

NOTE: This step requires the old upper spring *Hook* and *Adjustment Knob* from a legacy F&P.

1.1.9 Calibrate and Verify FPR-E Performance:

Follow detailed instructions in Sec 9 and 20, of the *FPR-E Assembly Procedures*.

Time Required: 0.10-Hours.

1.1.10 Train the Observer to download the FPR-E data:

Provide him/her a copy of the, *FPR-E Observer Instructions*.

Time Required: 0.50-Hours.

1.1.11 Complete Metadata and Site Inspection Reports:

Follow the same procedures as in the *FPR-E Assembly Procedures,* adjust words for "FPU to FPR-E Retrofit" as needed.

Time Required: 1.00-Hours.

1.1.12 Transmit the Precipitation Data to NCDC:

FTP the data from the red plastic Datakey.

FTP the data from the Zeno Logger (12-months). Invert to give chronological order.
http://www.nws.noaa.gov/ops2/Surface/documents/FPU_OperationsMan05Feb2007.pdf
Time Required: 1.00-Hours.

1.1.13 Return/Dispose of the FPU Battery and Parts:

NWS Logistics has determined that none of the FPU systems will be returned to NLSC stock. However, the FPU solar panel, the adjustable mounting bracket, and solar panel cable, are the only FPU items that HQ recommends be kept at the WFO for local or regional future use. All other FPU items, including the FPU Battery, will be locally disposed according to established NWS disposal guidelines.

Until all FPUs are removed from the field, Southern region has requested that certain parts be retained as spares for the sites that still have operational FPU equipment. For guidance on this regional initiative see Section 5, and Appendix C for the list of eight field offices

Time Required: TBD.

1.2 Tools and Equipment Required to Disassemble FPU:

Ensure the following tools and test equipment are available before your visit:

Table 1 - Tools and Test Equipment
Phillips Screw driver (#2)
Flat Blade Screw driver (1/4 inch)
7/16” and 9/16” wrenches
3/32” Allen wrench
Hand-truck or Dolly
Multi meter (or voltmeter and ohmmeter)
1/ 2” open wrench
Needlenose pliers with wire cutters/strippers
Laptop computer with modem and terminal emulation program (i.e., HyperTerminal) for access to Zeno data logger. This ***does not require*** Win95/98/ME.
Serial Communications Cable (for laptop) with 9-pin female end and 9-pin male end (not null modem)
Shovel

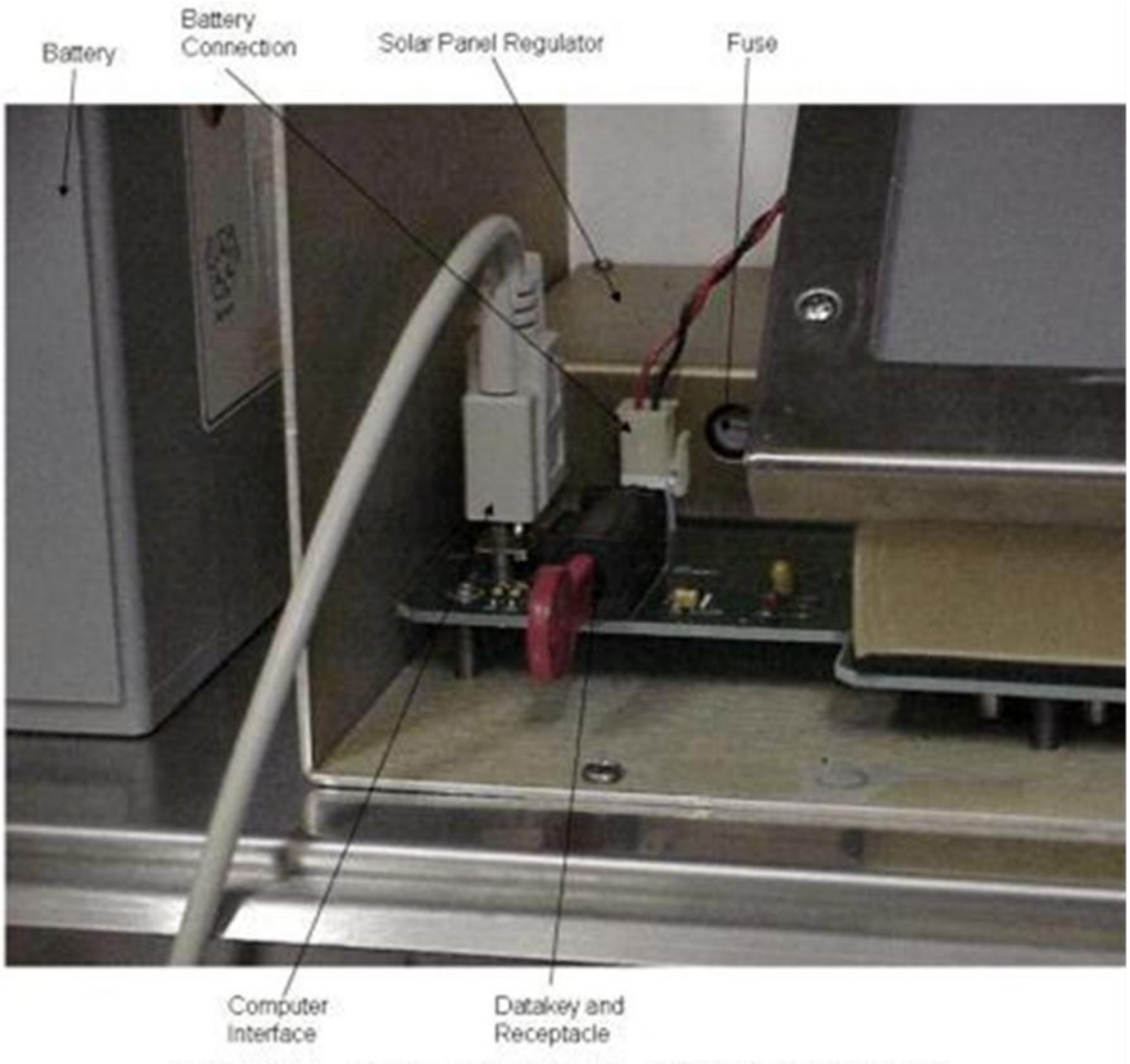

Fig 1.5 – Laptop and Datakey are required for FPU Disassembly.

2. Disassemble FPU Gauge.

For a detailed reference on how to disassemble the FPU, first print a copy of the *FPU Assembly Procedural* found on the NWS COOP modernization site:
http://www.nws.noaa.gov/ops2/Surface/documents/FPU_AsmblyPrcdrl08212006.pdf .
Then follow these specific instructions at the COOP site.

2.1 **Datakey Download:** Bring a good quality Datakey (red plastic) and download the last 55-days of 15-minute precipitation records. Follow instruction in Section 19.1 of the *FPU Assembly Procedural*. Bring the Datakey back to the WFO to upload the data to your WFO workstation. Use the FTP program to transmit the Zip file to NCDC as if this were the monthly routine.

2.2 **FPU Logger Download:** To cover the possibility that the Datakey download was unsuccessful, use your Laptop with HyperTerminal to copy the data contents of the Zeno Logger. Follow instructions in Section 11.5 in the *FPU Assembly Procedural*. Upload the logger file to your WFO workstation as a source of 15-min data as a backup source for any possible missing data.

Fig. 2.1 - FPU with GMA Pole.

2.3 **Remove Bonding Wire:** Disconnect the bonding wire from the bottom of the Enclosure and from the back of the support stage of the weighing assembly inside the rain gauge. This is the bonding wire installed with *FPU Mod Note #1 (issued Sept 2006).*

2.4 **Remove Solar Power Cable:** Unplug the Solar Cable from the base of the GMA Enclosure (i.e., steel box). The Solar Cable port is the one that is located apart from the other three, nearest to the front of the enclosure, **s**ee Fig 2.2.

CAUTION: Section 2.4 involves working on a LIVE electrical circuit. Do not allow your screwdriver or the disconnected cable pins to touch any exposed circuits, metal parts, or fall into a puddle of water.

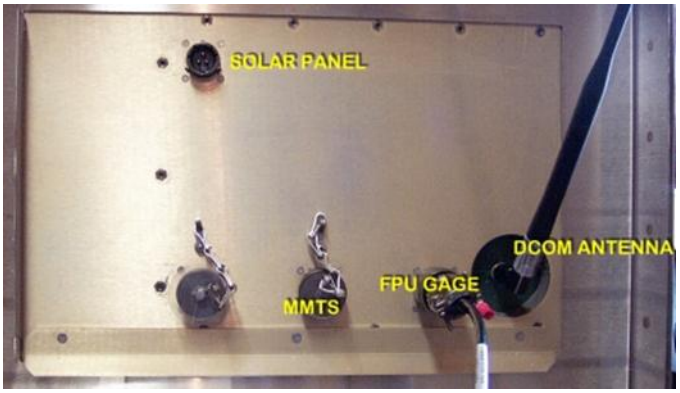

Fig 2.2 – Bottom of Enclosure – Solar and FPU Sockets

2.5 **Remove Battery Power:** Unplug the short red/black battery cable from its socket near the Data Key receptacle. This is the short one-foot paired wire from the battery terminals as shown in Figure 2.3.

The FPU should now be powered down, OFF.

Fig 2.3 – Inside the Enclosure – Battery and GMA Assembly.

2.6 **Unplug the Load-Cell Cable:** Unplug the Load-Cell Cable from the underside of the Enclosure and then unplug the other end from the small white plastic plug inside the F&P housing. Gently pull the cable out through the cable port in the F&P's base plate.

2.7 **Dismount Solar Panel from GMA Pole:** Use the half-inch open wrench to unfasten U-bolts that attach the solar panel to the GMA Pole. Use a flat blade screw driver to unfasten band-clamps. Leave the U-bolt secured that holds the mounting bracket for the

Enclosure, at this time. Roll up the solar panel cable and secure it within the back of the solar panel with nylon cable ties. Loosen the hinge bolts of the mounting bracket and fold it flat, and retighten.

2.8 **Remove 54-lb Battery from Enclosure:**

Leave the battery terminals covered with their caps. If plastic caps are unavailable, wrap the terminals in black electrical tape. Gain the assistance of second person to safely lift and lower the 54-lb battery to a hand-truck or dolly directly below the steel enclosure. Wheel the battery back to the government vehicle. Secure the battery so it does not shift around in the vehicle. Dispose of the 54-lb battery according to local office policy.

Fig 2.4 - 12V Battery (54-lbs)

Always follow the precautions outlined in NWS Manual 50-1115, *Battery Charging and Storage Operations*, to Chapter 15, on the web site: https://www.ops1.nws.noaa.gov/Secure/SAFETY/Safety_manual.htm.

2.9 **Remove GMA, Keypad and Zeno Data Logger:** Use a screwdriver to remove the three screws that attach the GMA assembly to the Steel Enclosure. Set the GMA Assembly aside.

2.10 **Dismount Enclosure from GMA Pole:** Remove any loose items from inside the Steel Enclosure. Close and latch the door. Remove the lower U-bolt from under the enclosure. Then with an assistant lift up, unhook, and then lower the Steel Enclosure to the ground.

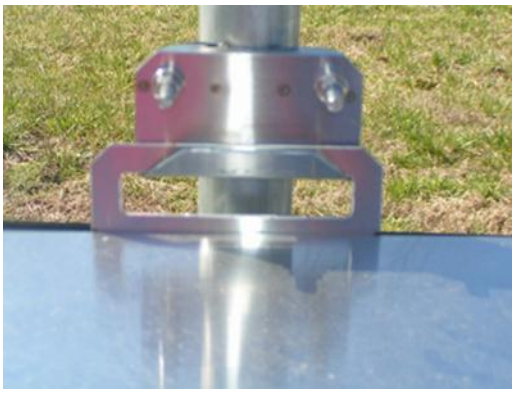

Fig 2.5 – Enclosure's Top Mounting Hook

Then, remove the U-bolt and its Bracket from the GMA Pole. The bracket with ends of U-bolt protruding, are visible in Fig 2.5.

2.11 **Dismount the Load Cell Assembly from F&P Support Stage:** First raise the Shipping Bolt to ensure the plunger is at least ¼ inch above the load cell ball. Use a short Allen wrench to loosen the four screws that attach the Load Cell to the support stage.

Fig 2.6 – Load Cell Assembly with 4 screws.

2.12 **Remove the Plunger:** With the lower-bracket arm sufficiently raised to expose the plunger, unthread the plunger. See Fig 2.7.

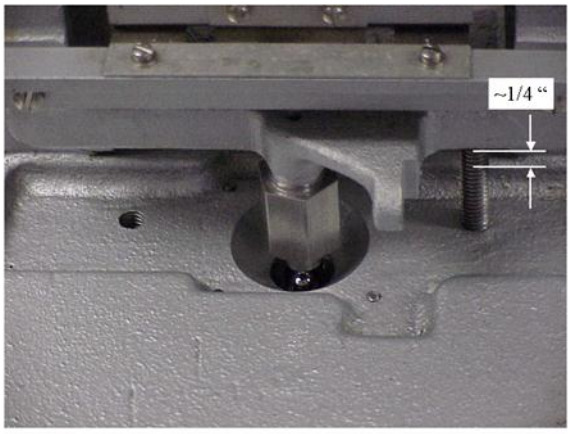

Fig 2.7 - Remove the Plunger (hexagonal)

2.13 **Check all 8 Flexures:** There are 4 on the top arm and 4 on the bottom arm. At the front and back of each arm there is one horizontal flexure and one vertical flexure. Replace any flexure that is bent, kinked, cracked, or broken.

Caution: The upper-rear-horizontal flexure is the one most susceptible to bending and damage. When moving the parallel arms, move them slowly and do not let them bounce.

All flexures must be flat and in good condition and all flexure mounting screws must be tight to ensure proper operation with the load cell.

2.14 **Retrieve all FPU Parts and Tools:** Collect all the tools (See Table 1, on Page 5) and collect all FPU parts (see Section 4, below) and all decanted fluids from the collection bucket, and any excess supplies from this maintenance action.

Caution: Always request the help of another person to lift or move the 54-lb battery. Use a hand-truck or dolly wherever possible to move battery between locations.

2.15 **Pack Used Parts into Cardboard Boxes:** Boxes can protect the interior of the Government truck/van from damage. Use cardboard to protect the solar panel from getting scratched, and use cardboard to protect the metal edges of the panel.

3. For Sites with Separate GMA Pole - Remove Pole and Restore Grounds (if necessary):

Half of all the FPU sites have a separate stand-alone 6-foot pole planted within 5-feet of the F&P three legged stand (Fig 2.1). The pole served to mount the Enclosure at a convenient height for the observer's routine access, and also be a mount for the solar panel. This pole bore the heavy weight, approximately 90 lbs., of the steel enclosure box, 12V battery, Zeno data logger, and the solar panel.

If the FPR-E solar panel is not going to be mounted on the pole where the FPU panel was located, the GMA pole and its footing must be removed and the ground put back to natural condition.

3.1 Coordinate with COOP Observer:

Before calling, decide whether you will use the GMA Pole to mount the FPR-E solar panel, or attach the panel to one of the three legs of the F&P stand, or use the existing place the FPU panel was attached.

Phone the COOP Observer and inform him/her how this FPR-E modernization will result in less equipment on site. Explain how the new electronic recorder is a compact module that fits within the white shell of the rain gauge. Consequently, we remove the steel enclosure and possibly its mounting pole.

If you are not going to use the pole, inform the Observer you will remove the pole and restore the grounds where the pole was planted and will bring grass-seed if requested.

Inquire about the general condition of the grounds about the GMA pole. Are there special tools required if the ground is rocky, compacted clay, compacted soil, or is it loose soil or a sandy composition?

3.2 Excavate Pole and Fill Hole (if required):

Fig 3.1 – Restore Grounds.

First, ensure all cables and grounding wires are removed from the site. Ensure the 12V battery was removed from the Enclosure, ensure the Solar Panel and the Enclosure have been removed from the GMA Pole.

Then use the garden shovel to dig the grounds about the concrete base of the GMA pole. Installation instructions had called for it to be buried at least 25-inches below ground surface.

Some sites, exposed to high winds, might have more concrete at the surface and have a deeper footing. Depending on the amount of concrete attached to the base of the pole, shovel away as much of the surrounding ground to expose the bottom of the concrete footing.

Some posts might have been modified with welded plates or rebar inserted to prevent twisting motion from wind loading. If so, then excavate more of the grounds about the post to free-up to the entire post and its footing.

If extra excavation does not work to dislodge the pole, it may be possible to cinch a heavy chain about the pole and pull the chain with the truck/van to dislodge the pole.

Dispose of the pole and concrete footer in accordance with local policy.

With the garden shovel, fill-in the hole with any displaced soil in an effort to restore the grounds. More dirt will be needed, have a source available. Tamp as you fill and make the ground as level as possible. If the ground had been grass covered in 2005 prior to FPU installation, replant this area with grass seed and water the ground. Cover the grass seed with straw or light mulch to retain moisture for germination of grass. One cubic foot of mulch should cover an area, 2-feet by 2-feet. Bags of mulch can be purchased at large home improvement stores.

4. Retention and Disposition of FPU Parts:

4.1 Retrieve Solar Panel and Mounting Bracket: Each forecast office may keep the Solar Panel (Fig 4.1) and Solar Mounting Bracket (Fig 4.3) because NWS no longer requires they be shipped to National Reconditioning Center. Offices may dispose of these parts if they have no potential use with other instruments or systems.

- Solar Panel - ASN D111C-3

Fig 4.1 - Solar Panel

- Solar Panel Cable – ASN D111C-3W1: The Solar Panel Cable (D111C-3W1) may be kept with the solar panel, or used for wiring of FPR-D solar panel.

Fig 4.2 - Solar Panel Cable

Note: If D111C-3W1 was used to extend the FPU solar panel location or was buried or in conduit from the solar panel location, you can use it to **extend the FPR-D solar panel wiring**, as well. Just cut off the mil connector and wire to the appropriate terminal strip connection.

- Solar Mounting Bracket – Unless you used this mount to attached the FPR-D panel, leave this attached to the FPU solar panel for future use by the WFO.

Figure 4.3 – Solar Mounting Bracket

4.2 Disposition of Remaining FPU Parts

All FPU parts not listed in 4.1 above, will be disposed of locally in accordance with local office policy.

Note: As of January 2013, offices in Southern Region are not expected to request spare FPU parts because NWSHQ authorized these offices to order FPR-E gauges, as a priority to replace failing FPU gauges.

4.3 Identification of Remaining FPU Parts

Dispose of these FPU parts locally, in accordance with local office policy.

- Gauge Modification Assembly (GMA).

Fig 4.4 – GMA Assembly

- 12V 84-AmpHr Battery

Fig 4.5 – FPU Battery

- Load Cell Assembly

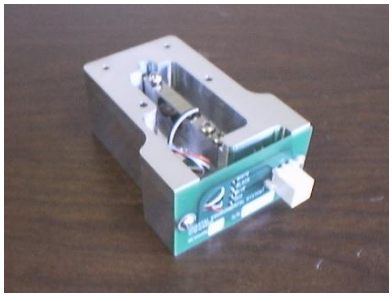

Fig 4.6 – FPU Sensor

Dispose of these FPU parts locally, in accordance with local office policy. (Continued)

- Load Cell Cable

Fig 4.7 – Sensor Cable

- FPU Battery Cable

Fig 4.9 – Battery Cable

- Datakey Reader Device, Software CD, and AC power adaptor.

Fig 4.10 – CES Inc. Key Reader Parts

Dispose of these FPU parts locally, in accordance with local office policy. (Continued)

- FPU Enclosure (ASN D111C-2A4)

Fig 4.11 – Stainless Steel Enclosure

Note: Metal parts can be turned over to a metal recycler facility if one is available within reasonable distance of your WFO.

APPENDIX A – REQUIRED HANDBOOKS FOR FPU DISASSEMBLY

1. Primary Resources On-Line:

a. **http://www.nws.noaa.gov/ops2/Surface/documents/FPU_AsmblyPrcdrl08212006.pdf**
FPU Assembly Procedural *– Aug 2006*

b. **http://www.nws.noaa.gov/ops2/Surface/documents/FPU_OperationsMan05Feb2007.pdf**
FPU Operations Manual *– Jan 2007*

c. **http://www.nws.noaa.gov/ops2/Surface/documents/FPRE_AsmblyPrcdr_17Feb 2012.pdf** ***FPR-E Assembly Procedures*** *- Feb 2012.*

d. http://www.srh.noaa.gov/ohx/dad/coop/FPR-E.html
- NWSTC Training Class – Clear, labeled photos of the new rain gauge, produced by Ralph Troutman (OHX).

e. http://www.srh.noaa.gov/ohx/dad/coop/f-p_images
- Clear photos of the original F&P rain gauge.

2. FPR-E Help Line at the Sterling Field Support Center (SFSC):

Phone the Sterling Field Support Center (SFSC), 8:30am – 5:00pm, Monday – Friday, on 703-661-1268; or e-mail them, nws.sfsc@noaa.gov . Before calling SFSC, write down the issue or question and inform your Regional COOP Manager by phone or email.

SFSC Contact Center Information

Main Line: 703-661-1268
Back-up Line: 703-661-1293
Email: nws.sfsc@noaa.gov

Contact the SFSC when you need to troubleshoot potential issues with the FPR-E kits. The SFSC is closed on all federal holidays. All emails and phone calls received during the hours of operation will be responded to in a timely manner. Emails received during non-operation hours will be returned in the order they are received on the following day in which the facility is open.

Your phone call to the SFSC should be the first point of contact made when you have any issue with the FPR-E kits. If the SFSC is unable to determine the correction for the issue, the SFSC will elevate it to NWS Headquarter level.

APPENDIX B - FPU PARTS AND AGENCY STOCK NUMBERS (ASN)

General Name	Short Description	Long Description	ASN	SMR *
Load Cell Assembly	Load Cell Assembly, FPU	Load Cell Assembly, FPU, complete with load cell PCB, block, post, cell, ball, and 4 long machine screws with washers and lockwashers.	**D111C-1A1**	PADDD
Load Cell Cable	Load Cell Cable, FPU	Load Cell Cable, FPU, 8 feet long, with connectors and integral strain relief.	**D111C-1W1**	PAOZZ
Anvil	Post, FPU, load cell.	Anvil or post for FPU load cell, mates F&P gauge to load cell ball.	**D111C-1A2**	PAOZZ
GMA	ZENO-GMA, FPU	Gauge Modification Assembly for Fisher & Porter Gauge Upgrade, includes Zeno datalogger, solar panel regulator, display, keypad, data key interface, and housing.	**D111C-2A1**	PAODD
- Regulator	Regulator PCB for Solar Panel, GMA, FPU	Regulator PCB for Solar Panel, GMA, FPU	**D111C-2A1A3A1**	PADDD
- Fuse	Fuse, Glass Tube, 250V, 3AG, Normal, 5-Amp	5 Amp fuse for solar panel regulator of GMA. Place holder. Pointer to ASN: 017-F-4-35 for real stock number.	**D111C-2A1F1**	PAOZZ
- DataKey	DataKey, serial memory key, 1Mb, SFK series	DataKey, serial memory key, 1Mb, SFK series flash memory, Datakey Electronics, Inc, PN 611-0083-002, Red color.	**D111C-2A2**	PAOZZ
- Battery	Battery, 12V, 84AH, Sealed Lead Acid	Battery, 12V, 84AH, Deep Cycle, AGM, Sealed Lead Acid, Bolt terminals, 54 lbs, wide temperature range, for solar panel applications, Concorde Battery Corporation, PVX-840T, Sun Xtender Series.	**D111C-2B1**	PAOZZ
- Cable, battery	Cable, Battery, internal to GMA, FPU	Battery Cable for inside GMA enclosure.	**D111C-2W1**	PAOZZ
- Enclosure	Enclosure, Steel, GMA, FPU.	Stainless Steel Enclosure, GMA, FPU, with mounting hardware and parts.	**D111C-2A4**	PAOZZ

Solar Panel	Solar Panel, 20W, 12V nom. @ 1.5A, reverse diode included, no regulator.	Solar Panel, 20W, Siemens ST20, 12V nom. @ 1.5A, reverse diode included, no regulator, metal frame, with pole mounting bracket.	**D111C-3**	**PAOZZ**
- Cable, Solar Panel	Cable, Solar Panel to GMA, FPU.	Solar Panel Cable, with connector and junction box, use between FPU GMA and ST20 solar panel	**D111C-3W1**	PAOZZ
FPU External Parts	Cable, Thermistor to GMA, FPU	Thermistor cable, direct burial, use between MMTS beehive and GMA.	**D111C-4W1**	PADDD
FPU Off-Site Parts	DataKey reader, power supply, and application CD-rom.	DataKey reader, power supply, and application CD-rom , for use with FPU written Datakeys.	**D111C-6**	PAOZZ
FPU Test Plug	Testing instrument to isolate the rain gauge load sensor.	FPU Load Sensor Test Plug	**D111C-1A1T1**	PAOZZ

* The FPU unit has just three types of Source, Maintenance, and Recoverability (SMR) codes assigned to its parts: PADDD, PAODD, and PAOZZ.

Reference: **EHB-1, *Instrumental Equipment Catalog* (Issuance 1996-1),** Section 2.3, Source, Maintenance and Recoverability Code (SM&R).

PADDD: You must return these parts (i.e., faulty regulator) to National Reconditioning Center (NRC) in exchange for a replacement.
The 'PA' signifies item procured and stocked for anticipated or known usage that is not deteriorative in nature; the 'DD' signifies the part must be shipped to the depot (NRC) together with its integral component(s) for disassembly and be repaired by the depot (NRC); and the final 'D' signifies that just the depot (NRC) is authorized to repair, condemn, or dispose of this part.

PAODD: You must return these parts (i.e., faulty GMA) to NRC in exchange for a replacement.
The 'PA' signifies item procured and stocked for anticipated or known usage that is not deteriorative in nature; the 'OD' signifies this part shall be isolated and removed by the field and shipped to the depot (NRC) where the depot (NRC) will perform the repair; and the final 'D' signifies that just the depot (NRC) is authorized to repair, condemn, or dispose of this part.

PAOZZ: A non-repairable part. You may dispose of these parts (i.e., 5 Amp fuse) at the Weather Forecast Office (WFO).
The 'PA' signifies item procured and stocked for anticipated or known usage that is not deteriorative in nature; the 'OZ' signifies the field level shall remove and replace this part, however it is non-repairable and no repair to the item is authorized. The final 'Z' signifies that the field office is authorized to condemn and dispose of the part when it becomes unserviceable.